Environmental Response Team Monitoring and Analytical Capabilities For Pre-deployments

INTRODUCTION

The U.S. EPA Environmental Response Team (ERT) provides monitoring and analytical capabilities at pre-deployments. The ERT can provide personnel who will be on 24-hr call via cell phone or pager. The team will be prepared to operate the following monitoring instruments and equipment in Level A, B and C protection.

MONITORING INSTRUMENTS AND EQUIPMENT

AP2C CHEMICAL AGENT MONITOR - The AP2C is a portable, hand-held instruments designed to identify the specific class of nerve agent or mustard vapor in the air. The AP2C can be used to search out clean areas, identify contaminated materials and monitor the effectiveness of decontamination. The AP2C responds to nerve and mustard agent vapors. (GA, GB, GD, GF, VX, and HD)

APD2000 CHEMICAL AGENT MONITOR - The APD2000 is a portable, hand-held instruments designed to identify the specific class of nerve agent or mustard vapor in the air. The APD2000 can be used to search out clean areas, identify contaminated materials and monitor the effectiveness of decontamination. The APD2000 responds to nerve and mustard agent vapors (GA, GB, GD,, VX, HD, HN, Lewisite, pepper spray and mace) down to the lowest concentrations that could affect personnel over a short period.

RAESYSTEMS MULTIRAE MULTIGAS MONITOR PGM-50 PHOTOIONIZATION DETECTOR - The MultiRAE is a portable, hand-held, microprocessor controlled instrument designed for measuring the presence of photoionizable chemicals in air at part per million (ppm) levels. In addition the MultiRAE can detect inorganic compounds (e.g., CO, H_2S, SO_2, NO, NO_2, Cl_2, HCN, NH_3, PH_3, and O_2) with electrochemical sensors, combustible gases with a catalytic bead sensor. The response depends on the chemical type as well as the concentration. In the photoionization detector (PID) mode, the MultiRAE does not distinguish one type of chemical from another, but displays a number indicating the total concentration of all photoionizable compounds in the sample.

PHOTOVAC MICROFID FLAME IONIZATION DETECTOR - The MicroFID is a portable, hand-held instrument designed for measuring the presence of flame ionizable chemicals in air at ppm levels. The MicroFID can detect carbon compounds containing different types of airborne gases and vapors. The MicroFID can detect thousands of different types of airborne gases and vapors. The MicroFID does not distinguish one type of chemical from another, but displays a number indicating the total concentration of all flame ionizable compounds in the sample.

DRAGER MULTIWARN - The Multiwarn is a portable, hand-held, microprocessor controlled instrument designed for monitoring up to four atmospheric gas hazards simultaneously. The Multiwarn measures oxygen, combustible gas, and up to two additional toxic gases. Currently, the available toxic sensors for use in the Multiwarn include H_2S and CO.

BIOSYSTEMS CANNONBALL2 - The Cannonball2 is a portable, hand-held, microprocessor controlled instrument designed for monitoring up to four atmospheric gas hazards simultaneously. The Cannonball2 measures oxygen, combustible gas, and up to two additional toxic gases. Currently, the available toxic sensors for use in the cannonball include H_2S, CO, SO_2, (NO, NO_2, and HCN.

BIOSYSTEMS PhD ULTRA MULTI GAS DETECTOR - The PhD Ultra is a portable, hand-held, microprocessor controlled instrument designed for monitoring up to four atmospheric gas hazards simultaneously. The PhD Ultra can be operated in either a "Diffusion" or "Sample-Draw" mode. The PhD Ultra uses highly specific, electrochemical toxic sensors that have been designed to minimize the effects of common interfering gases. Toxic sensors available for use in the PhD Ultra include H_2S, CO, SO_2, Cl_2, HCN, NH_3,NO, and NO_2.

MIRAN SAPPHIRE PORTABLE AMBIENT AIR ANALYZER - The Miran Sapphire Ambient Air Analyzer is an intrinsically safe, portable, microprocessor controlled single beam spectrophotometer used to measure concentrations of toxic gases or vapors in the ambient air. With spectra library software containing approximately 400 compounds, the Miran Sapphire can be used to identify unknown gases.

MDA SCIENTIFIC SINGLE POINT MONITOR (SPM) - The SPM Tapemeter uses a chemcassette detection system to

monitor for specific toxic airborne gases. There are a wide variety of compounds which can be detected. Detection limits and sample times vary depending on the compound. Currently, the available tapes for use in the SPM tapemeter include aliphatic amines, aromatic amines, NH_3, diisocyanates, hydrazine, hydrides, HCN, H_2S, mineral acids, bromine, chlorine/oxidizers, Cl_2, ClO_2, hydrogen peroxide, NO, O_3, phosgene, and SO_2.

JEROME 431 MERCURY VAPOR ANALYZER - The 431 is a portable, hand-held, microprocessor controlled instrument using gold film technology to monitor for mercury vapor. The 431 can monitor for mercury vapor at microgram per cubic meter levels.

JEROME 631-X HYDROGEN SULFIDE ANALYZER - The 631-X is a portable, hand-held, microprocessor controlled instrument using gold film technology to monitor for H_2S at part per billion (ppb) levels.

MIE DATARAM - The DataRAM is a portable, hand-held, microprocessor controlled instrument that samples air and measures the concentration of airborne particles while providing a direct and continuous readout as well as electronic recording of the information. The DataRAM is a high sensitivity nephelometric monitor whose light scattering sensing configuration is optimized for the measurement of the concentration of airborne dust, smoke, fumes, and mist in industrial and ambient environments.

LUDLUM RADIOLOGICAL SURVEY METERS - Ludlum rate meters with accompanying probes measure alpha gamma and beta radiation.

THERMO-EBERLINE RADIATION INSTRUMENTATION with accompanying probes measures alpha, beta and gamma radiation.

RADECO AIR SAMPLERS collect particulate air samples for onscene airborne determinations using the Ludlum Model 3030 alpha-beta scaler.

GENETRON GAMMA TRACE DETECTORS remotely deployed ambient gamma level detectors for monitoring changes in gamma exposure rates.

BERKELEY NUCLEONICS GAMMA SPECTROMETERS for realtime gamma emitter identification.

EXPLORANIUM GR-135 GAMMA SPECTROMETERS, portable handheld realtime gamma emitter identification.

SIEMENS MARK II ELECTRONIC PERSONNEL DOSIMETERS for detecting alarm levels of gamma and beta radiation for entry personnel.

TRIMBLE GPS SYSTEMS, portable sub-meter global positioning system units for tracking measurement locations in the field.

DURRIDGE RAD-7 RADON DETECTOR, portable alpha spectrometry system for making realtime radon measurements in the field.

DRAEGER CHEMICAL DETECTION SYSTEM (CDS) - Draeger tubes are colorimetric tubes designed to monitor for various type of nerve, blister, lung, blood, and nose and throat irritating agents.

CHEMICAL AGENT DETECTOR KIT M256A1 - The chemical agent detector kit can detect nerve agents (G and V), blood agents (AC and CK), blister agents (H, HD, and CX), and Lewisite.

CHEMICAL AGENT DETECTOR PAPER VGH, ABC-M8 - This paper detects nerve agents (G and V) and blister agents (H) with liquids only.

RUGGEDIZED ADVANCED PATHOGEN IDENTIFICATION DEVICE (RAPID) SYSTEM - The RAPID System is a field-portable high-speed thermocycler with built in fluorescence monitoring system that allows for simultaneous testing for pathogens such as Anthrax, Y. pestis, f. tularensis, and brucella. Detection is based upon polymerase chain reaction (PCR). Sample results are available in under 30 minutes. Freeze-dried reagent kits used with the RAPID system allow for DNA amplification and fluorescence monitoring for specific pathogens.

BIO THREAT ALERT (BTA) TEST STRIPS - The BTA test strip system can be utilized for rapid, on-site analysis of unknown biological samples. Currently, BTA test strips are available for anthrax, ricin, botulinum toxin, SEB, plague, tularemia, and brucella.

MESOSYSTEMS BIOCAPTURE BT-550 - The BT-550 collects and traps airborne particles, 0.5 to 10 microns in size, in a patented solution, which can be tested using the BTA test strips or any generally accepted laboratory methodology. For each “air sample” up to 10 BTA tests can be performed.

GUARDIAN BTA READER - The Guardian provides on-site screening of unknown biological samples. The unit reads the BTA Test Strips, to reduce human error/interpretation.

SMART TESTING PROCEDURES - The SMART testing procedures are rapid field analyses for biological compounds. The available SMART testing procedures include ricin, yersinia pestin, staphylococcus enterotoxin b, and anthrax.

TRACE ATMOSPHERIC GAS ANALYZER (TAGA) - TAGA instruments consist of triple quadrupole mass spectrometers using atmospheric chemical ionization, either at atmospheric pressure or at reduced pressure, usually in the range of 1 to 4 Torr. TAGA Mobile Laboratories consists of the TAGA instruments and Agilent GC/MS instruments mounted in a mobile bus and are used to provide real time concentrations of toxic substances in ambient air. They have also been used to provide very rapid analyses of gas samples from specific sources. The mobile buses include satellite

communications and internet access for truly independent operation.

INFICON HAPSITE - The Inficon HapSite is a field-portable gas chromatograph/mass spectrometer (GC/MS) that can be operated from battery or AC line power. The basic instrument was designed to analyze samples in the parts per billion (ppb) to parts per million (ppm) range. The primary application is for direct air measurements. An equilibrium headspace sample accessory can be used to concentrate VOCs from water, soil, and sludge matrices.

AREARAE WIRELESS MULTI-GAS MONITOR - The AreaRAE Multi-Gas monitor is a portable instrument that provides real-time measurement of toxic gases, oxygen, and combustible gases. The programmable monitor contains up to five sensors, with alarm capability. A central computer queries the monitors remotely, without wires, downloads the data, and affords remote programming of the monitors.

SENSIR TECHNOLOGIES TRAVEL/IR - The Travel/IR is a Fourier Transform Infrared (FT-IR) spectrometer that can be used for both quantitative and qualitative materials analysis. It can be used for the analysis of solids, powders, pastes, gels, and liquids. The technique is nondestructive. Once a sample is presented to the instrument, the response is real-time. The unit is portable and best suited for set up in a response vehicle.

MULTIPLE ROLE RESPONSE VEHICLE (MRRV) - To provide rapid response, maintain communications, and transport necessary equipment to emergency situations, ERT has a mobile bus configured for deployment. The mobile unit has satellite communications, internet access, and storage space and power to maintain and calibrate field instruments.

GRAB SAMPLING TECHNIQUES - Air samples for subsequent laboratory analysis can be obtained with sampling trains consisting of collecting media and a pump calibrated to a specific flow. Air is drawn through the collecting media where the contaminant is adsorbed or absorbed by low flow (one to two lpm) or high flow (10 to 15 lpm) pumps. These techniques are used to collect samples for analysis of metals, dioxin/furans, polychlorinated biphenyls, (PCBs), and polycyclic aromatic hydrocarbons (PAHs), for example.

SUMMA® CANISTERS - Canisters are six liter, leak-free stainless steel pressure vessels with valve and a passivated interior. An ambient air sample is allowed into the pre-evacuated SUMMA® passivated canister by opening the valve. Alternatively, subatmospheric pressure sampling may be performed using a fixed orifice, capillary, or adjustable valve for taking grab samples or short duration time-integrated samples. Sampling is usually performed for VOCs in ambient air. The VOCs are subsequently separated by gas chromatography (GC) and measured by mass-selective detector or multi-detector techniques

PERSONNEL PROTECTION

LEVEL "A" RESPONSE PERSONAL PROTECTIVE EQUIPMENT

Trelleborg Trellchem TLU - Trellchem® TLU is a limited use fully encapsulating suit designed to have a self-contained breathing apparatus (SCBA) worn inside the suit. The suit is made with polyamide fabric laminated on each side with a barrier film laminate. The seams are stitched and covered with a welded-on barrier film laminate strip. Trellchem® TLU provides protection against hazardous chemicals in liquid, vapor, gaseous and/or solid form.

Trellchem® VPS Type TE - The VPS TE suit is a totally encapsulating level A suit designed to have the breathing apparatus worn inside the suit. The VPS is certified by SEI (Safety Equipment Institute in Chicago, USA) according to the American standard NFPA 1991, including the optional requirement for chemical and biological terrorism protection. This suit meets all the performance requirements including the flammability and abrasion resistance tests without anything additional over garment. The suit is made of polyamide fabric coated on the outside with chloroprene rubber, and coated inside with chloroprene rubber and a barrier film laminate.

Trellchem® HPS type TE - The HPS type TE is the top of the line Trelleborg totally encapsulating/level A suit. The HPS is certified by SEI (Safety Equipment Institute in Chicago, USA) according to the American standard NFPA 1991, including the optional requirement for chemical and biological terrorism protection. This suit meets all the performance requirements including the flammability and abrasion resistance tests without any additional over garment. The suit is made of polyamide fabric coated on the outside with butyl rubber and an additional top layer of Viton®, and coated inside with chloroprene rubber and a polymer barrier laminate.

GEOMET RESPONDER CSM Completely Encapsulating Chemical Suit - The suit is constructed of a patented material designed to provide a high degree of permeation resistance to a wide range of chemicals. It affords protection against petroleum products and halogenated hydrocarbons, as well as against nerve and blister agents. These suits are designated as limited use and are discarded following exposure to a hazardous environment but are discarded. The suit has an expanded back to accommodate an SCBA, but does not have a pass through to allow for use with a supplied-air respirator.

LEVEL "B" PERSONAL PROTECTIVE EQUIPMENT - TYVEK/SARANEX 23-P HAZMAT RESPONSE SUIT - This is a fully encapsulating Level-B suit which provides for additional splash protection. The garment has an expanded back and rear zipper to accommodate an SCBA. The use of a chemically resistant film on Tyvek provides a high level of permeation resistance to many chemical substances. The suit construction includes elastic wrists, attached booties, a PVC face shield and exhaust ports.

AIR QUALITY DISPERSION MODELING

CALPUFF MODEL - CALPUFF is an advanced non-steady-state meteorological and air quality modeling system. The model has been adopted by the U.S. EPA in its *Guideline on Air Quality Models* as the preferred model for assessing long range transport of pollutants and their impacts on Federal Class I areas and on a case-by-case basis for certain near-field applications involving complex meteorological conditions. The modeling system consists of three main components (CALPUFF an air quality dispersion model), preprocessing program (CALMET a diagnostic 3-dimensional meteorological model) and postprocessing program (CALPOST).

HAZARD PREDICTION AND ASSESSMENT CAPABILITY (HPAC) MODEL - The HPAC automated software system provides the means to accurately predict the effects of hazardous material releases into the atmosphere and its impact on civilian and military populations. The system uses integrated source terms, high-resolution weather forecasts and particulate transport analyses to model hazard areas produced by chemical, biological and nuclear weapon incidents and industrial accidents.

INDUSTRIAL SOURCE COMPLEX SHORT TERM MODEL (ISCST3) - The ISCST3 model is the US EPA's current regulatory model for many New Source Review (NSR) and other air permitting applications. The ISCST3 model is based on a steady-state Gaussian plume algorithm, and is applicable for estimating ambient impacts from point, area, and volume sources out to a distance of about 50 kilometers. ISCST3 includes algorithms for addressing building downwash influences, dry and wet deposition algorithms, and also incorporates a complex terrain screening algorithms .

CONTAM - CONTAM is a multi-zone indoor air quality and ventilation analysis computer program designed to help predict: *Airflows*: infiltration, exfiltration, and room-to-room airflows in building systems driven by mechanical means, wind pressures acting on the exterior of the building, and buoyancy effects induced by the indoor and outdoor air temperature difference. *Contaminant Concentrations*: handles the generation, deposition, adsorption, desorption and dispersal airborne contaminants. *Personal exposure*: the predictions of exposure of occupants to airborne contaminants for eventual risk assessment.

OPEN BURN OPEN DETONATION MODEL (OBODM) - OBODM is intended for use in evaluating the potential air quality impacts of the open burning and detonation (OB/OD) of obsolete munitions and solid propellants. OBODM uses cloud/plume rise dispersion, and deposition algorithms taken from existing models for instantaneous and quasi-continuous sources to predict the downwind transport and dispersion of pollutants released by OB/OD operations.

SLAB MODEL - The SLAB model treats denser-than-air releases by solving the one-dimensional equations of momentum, conservation of mass, species, and energy , and the equation of state. SLAB handles release scenarios including ground level and elevated jets, liquid pool evaporation, and instantaneous volume sources.

GIS CAPABILITIES: The output from the above models can be quickly plotted in ESRI's ArcGis software to produce high quality maps displaying local geographic data (Digital Orthophoto Quarter Quadrangles, road networks, infrastructure, topography and other custom data.) These data can also be exported and easily shared with other agencies.

MONITORING AND ANALYTICAL INSTRUMENTATION QUICK REFERENCE GUIDE

Instrument	Chemical Class	Field Use	Display
AP2C	Nerve/Mustard Agents	Hand-held	Real-Time
APD2000	Nerve/Mustard Agents	Hand-held	Real-time
MultiRae PGM-50	Volatile Organics & Acid Gases	Hand-held	Real-time
MicroFid	Volatile Organics	Hand-held	Real-time
Multiwarn	Acid Gases	Hand-held	Real-time
Cannonball2	Acid Gases	Hand-held	Real-time

Instrument	Chemical Class	Field Use	Display
PhD Ultra Gas Meter	Acid Gases	Hand-held	Real-time
Sapphire	Volatile Organics & Inorganics	Hand-held	Real-time
Snapshot	Volatile Organics	Hand-held	Real-time
MDA Tapemeter	Volatile Organics & Inorganic	Hand-held	Real-time
Jerome MVA	Mercury	Hand-held	Real-time
Jerome H2S	Hydrogen Sulfide	Hand-held	Real-time
DataRAM	Particulates	Hand-held	Real-time
Draeger Tubes	Volatile Organic Inorganic & Chemical Agents	Hand-held	Near Real-time
M256A1 Kit	Chemical Agents	Hand-held	Near Real-time
M8 Paper	Chemical Agents	Field Portable	Near Real-time
RAPID System	Biological Agents	Field Portable	Near Real-time
Bio Threat Alert Test Strips	Biological Agents	Hand-held	Near Real-time
Smart Testing Procedures	Biological Agents	Hand-held	Near Real-time
TAGA Mobile Laboratories	Chemical Agents, Acid Gases	Mobile Bus	Real-time
Inficon HapSite	Chemical Agents	Field Portable	Near Real-time
AreaRAE Multigas Monitors (12)	Chemical Agents	Field Monitors	Real-time
Travel IR	Chemical Agents	Field Portable	Near Real-time
Multiple Role Response Vehicle	Communications and Equip. Support	Mobile Bus	Real-time Communications
Grab Sampling Techniques	Chemical Agents	Field Portable	Requires Lab Analysis
Ludlum	Radiation	Hand-held	Real-time
Thermo-Eberline	Radiation	Hand-held	Real-time
Radeco	Particulates	Hand-held	Near Real-time

Instrument	Chemical Class	Field Use	Display
Genetron Gamma	Radiation	Field Portable	Real-time
Berkeley Nucleonics	Radiation	Hand-held	Real-time
Exploranium GR-135	Radiation	Hand-held	Real-time
Siemens Mark II	Radiation	Hand-held	Real-time
Durridge Rad-7	Radiation	Field Portable	Near Real-time
SUMMA® Canister	VOCs	Hand-held	Requires Lab Analysis